

Divert Architectures and Guidance, Navigation, and Control to Enable Pinpoint Landing for Planetary Exploration

Completed Technology Project (2012 - 2015)



Project Introduction

Planetary exploration missions in the future will require pinpoint landing capability (within 100 m) as scientific and safety needs increase. The research training plan put forth here will assess a range of new architectures that meet NASA requirements for pinpoint landing. After hypersonic deceleration, a high-altitude divert maneuver will be performed to target a landing site. Such a maneuver could ease the divert requirements later in the trajectory and might be feasible for missions utilizing low-ballistic coefficient vehicles (that may also have supersonic retropropulsion) that terminate hypersonic deceleration very high up in the atmosphere. The goals of this research study are to analyze implementing this maneuver in proposed Mars missions for performance and feasibility. A numeric trajectory simulator will be used to assess performance in terms of accuracy and propellant mass fraction. A detailed study into guidance, navigation, and control performance in regards to this mission design will also be conducted. Feasibility will be assessed using systems level studies of past and proposed vehicles. Expected outcomes of this study are well-characterized performance qualities of this high-altitude divert maneuver, a vehicle and systems analysis utilizing this architecture, and a prototype guidance, navigation, and control strategy for this maneuver that can achieve pinpoint landing.

Anticipated Benefits

Planetary exploration missions in the future will require pinpoint landing capability (within 100 m) as scientific and safety needs increase. Expected outcomes of this study are well-characterized performance qualities of this high-altitude divert maneuver, a vehicle and systems analysis utilizing this architecture, and a prototype guidance, navigation, and control strategy for this maneuver that can achieve pinpoint landing.



Project Image Divert Architectures and Guidance, Navigation, and Control to Enable Pinpoint Landing for Planetary Exploration

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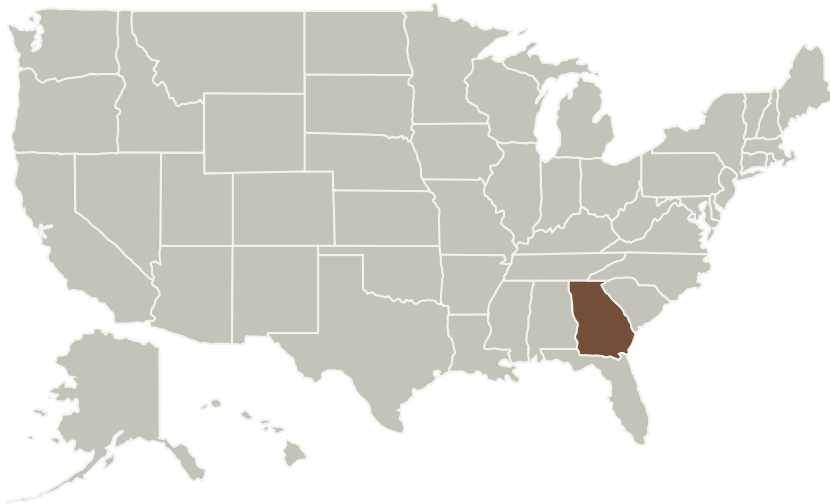
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Georgia Institute of Technology-Main Campus(GA Tech)	Supporting Organization	Academia	Atlanta, Georgia

Primary U.S. Work Locations

Georgia

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Robert D Braun

Co-Investigator:

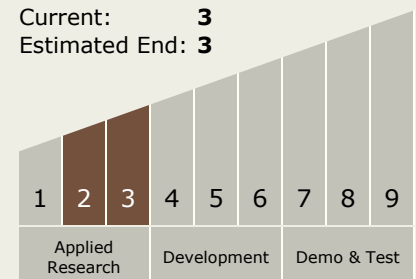
Amit B Mandalia

Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



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Images



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Project Image Divert Architectures and Guidance, Navigation, and Control to Enable Pinpoint Landing for Planetary Exploration
(<https://techport.nasa.gov/image/1836>)

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.7 Guidance, Navigation and Control (GN&C) for EDL